

CLAIMS

1. Device for transverse immobilization of long nuclear fuel assemblies housed in compartments of the same length with several walls, characterized in that it comprises:

- 5       - a fixed structure (3) rigidly attached to the compartment, located on one of its surfaces and comprising at least one guide element (5) transverse to the longitudinal direction of the assembly,
- 10       - a structure (6) that can be moved in the transverse direction, capable of applying pressure on the fuel assembly and comprising at least one transverse guide element (7) working in cooperation with the element (5) on the fixed
- 15       structure (3),
- an adjustable clamping means (8) comprising at least one adjustable clamping element (10, 20, 31, 32, 47) capable of clamping or unclamping the mobile structure (6) on the fuel assembly using
- 20       an adjustment device (14, 22, 33, 48), and a control device (15, 21, 34, 43) that can be manipulated from the accessible end of the fuel assembly, the said control device acting on the clamping element or its adjustment device to fix
- 25       the assembly in position by reaction on the fixed structure (3), or to release it.

2. Device according to claim 1, characterized in that the mobile structure (6) comprises a plane plate parallel to the fuel assembly replacing at least part of the compartment wall.

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3. Device according to any one of claims 1 or 2, characterized in that the clamping elements (10, 20, 31, 32, 47) are elastic.

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4. Device according to any one of claims 1 to 3, characterized in that the guide elements (5, 7) fixed on the fixed structure (3) and the mobile structure (6) slide in each other.

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5. Device according to any one of claims 1 to 4, characterized in that the fixed structure (3) and the mobile structure (6) are connected together by a return spring (17).

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6. Device according to any one of claims 1 to 5, characterized in that the adjustable clamping means (8) comprises:

at least one clamping element comprising one or several spring leaves (10) separated from each other, of which a free end bears on a plate (11) rigidly attached to the structure (6) that moves in the transverse direction, and the other end is rigidly attached to the fixed structure (3) by means of a hinge pin (12) and its support (13),

an adjustment device comprising one bar (14) for each leaf (10), rigidly fixed at at least one of its ends to a control device comprising an upright (15) parallel to the major axis of the fuel assemblies, which can be moved along this direction and projecting from the accessible end of the compartment, each of the said bars (14) being supported on a spring leaf (10).

7. Device according to claim 6, characterized in that the upright (15) slides inside a section (16) rigidly attached to the fixed structure (3).

5        8. Device according to any one of claims 1 to 5, characterized in that the adjustable clamping means (8) comprises:

at least one clamping element comprising a curved spring leaf (20) with an elongated shape, placed  
10 longitudinally with a convex surface facing the mobile structure (6) that is free to move in the transverse direction and supported on an adjustment device comprising a roll (22) fixed to the said mobile structure (6) through a support (23),

15        a control device comprising a support (21) free to slide longitudinally, projecting from the accessible end of the compartment and bearing on the fixed structure (3), the leaf spring (20) being fixed at one of its ends on the said support (21), the other end  
20 being free and bearing on the said support (21).

9. Device according to any one of claims 1 to 5, characterized in that the adjustable clamping means (8) comprises:

25        . at least one clamping element comprising at least one pair of connecting rods, one being called the "fixed" rod (31) and the other the "mobile" rod (32), one of their ends being fixed to a sleeve (33) moving in the longitudinal direction, using a hinge, the other end  
30 of the "fixed" rod (31) being rigidly attached to the fixed structure (3) by means of a hinge, the other end of the "mobile" rod (32) being rigidly attached to the mobile structure (6) by means of a hinge, the

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rods (31, 32) being positioned such that they form a V with a variable angle;  
a control device (34) rigidly attached to the fixed structure (3) used to activate the sleeve (33)  
5 longitudinally starting from the accessible end of the compartment.

10 10. Device according to claim 9, characterized in that the control device comprises a worm screw (34) that does not move longitudinally and that cooperates with a screw thread formed in the sleeve (33).

15 11. Device according to any one of claims 1 to 5, characterized in that the transverse guide elements (5, 7) and the adjustable clamping means (8) are combined.

20 12. Device according to claims 9, 11, characterized in that the combined transverse guide and clamping means comprise a device fixed to the connecting rods (31, 32) that cooperates with the control device (34) to impose an angle on the V formed by the connecting rods (31, 32) that depends on the position of the sleeve (33).

25 13. Device according to claim 11, characterized in that the combined guide elements and the adjustable clamping means comprise:

30 . a cylindrical jack body (41) with a transverse axis, rigidly attached to the fixed structure (3) comprising a guide rod (42) in which a compressed air inlet duct (43) has been formed along its axis projecting from its free end, a plurality of cylindrical chambers (46) at its periphery with an

axis parallel to the jack axis, each of the chambers (46) containing a compression spring (47),  
 . a fixed piston (44) rigidly attached to the said free end of the guide rod (42) comprising a seal (45) at its periphery,  
 5 . a mobile collar (48) rigidly attached to the mobile structure (6) located inside the jack body (41) and adjusted to the shape of the said jack body, this collar being inserted between the fixed piston (44) and the jack body (41) and sliding along the guide rod (42) along a corresponding bore formed in the said collar (48), the said collar also comprising at its periphery a plurality of housings (49) that nest in an adjusted manner into each of the chambers (46)  
 10 by moving transversely to the longitudinal direction of the fuel assembly,  
 15 . a compressed gas supply means opening at the accessible end of the compartment and carrying gas into the space located between the fixed piston (44) and the mobile collar (48) through the duct (43), the springs (47) clamping the mobile structure onto the fuel assembly.

14. Device according to any one of claims 1 to 5, characterized in that the adjustable clamping means (8) comprises a control device opening to the outside of the compartment which controls the cams which bear on the mobile structure (6).

30 15. Compartment forming a housing for nuclear fuel assemblies characterized in that it is equipped with one or several immobilization devices according to claims 1 to 14.

16. Container for the transport of nuclear fuel assemblies, characterized in that it comprises a plurality of compartments according to claim 15.

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